Remarks

Claims 5 and 9-15 were pending.

Claims 5, 9, 11 and 15 are amended.

Claims 12-14 are cancelled.

Claims 16-21 are new.

Claims 5, 9-11 and 15-21 are now pending.

Amended and New Claims

Claim 5 is amended to specify the amount of component B). Support for this amendment may be found on page 22, line 4.

Claim 15 is analogously amended but also eliminates formula II.

Process claim 9 is amended to require that the composition according to claim 5 be capable of curing at a rate of at least 100meters/min. Basis for this amendment may be found in the examples 1,2 and 5 Table 1. Note that all specific formulae claimed have curing rate well above 100 meters/min.

New claim 19 is analogous to amended claim 9 but depends from claim 15 rather than claim 5.

Claim 11 is amended to depend from claim 5.

New claim 16 depends from claim 5 and specifies the amount of aminoacrylate in the compositions. This amendment is supported by the examples on page 38 and Table at top of the page.

New claim 17 is analogous to claim 16 but depends from claim 15.

New claims 18 and 19 are supported by original claims 13 and 12 respectively but depend from claim 15.

New claim 20 is supported by the examples on page 39, Table I.

New claim 21 is support by the examples on page 38, under UV exposure apparatus.

No new matter is added.

Claim Objections

Applicants have cancelled claims 12-14 making the examiner's objections moot.

35 USC 112, second paragraph

Claim 11 is amended to depend from claim 5.

Double Patenting Rejection

Claims 5 and 9-15 are rejected on the ground of nonstatutory obviouness-type double patenting as being unpatentable over claims 1 and 8-11 are of US Patent No. 7,084,183.

Examiner believes that the initiators claimed in US '183 is the same photoinitiator of formula II found in instant claim 1. See page 7 of the Office Action of February 27, 2009. Applicants respectfully disagree.

Neither Formula Ia or IIa are the same formula II found in instant claim 5 or claim 15. Applicants bring to the examiner's attention that the instantly claimed formulae II, III and V have different phenyl connecting moities. Thus there is absolutely no overlap between the formula Ia and IIa and the instantly claimed formulae II, III and V. Claims 1 and 8-11 of US '183 do not encompass the instantly claimed photoinitiators. Thus the examiner's statement that the instant claims, as written, cannot be infringed without literally infringing upon the claims of US '183 is incorrect. Therefore, applicants respectfully request that the double patenting rejection be withdrawn.

35 USC 103(a)

Claims 5 and 9-15 are rejected under 35 USC 103(a) as being unpatentable over Felder, US 4,308,400 as applied to claim 1 above, and in view of Gaske, US 3,844,916.

Examiner has responded to the applicants unexpected results arguments with several questions.

Examiner has stated that it is not exactly clear what applicant's cure rate in the examples means in relation to the belt speed, which is variable according to page 38. Is the curing rate some variation of percent reacted acrylate unsaturation? Thus, tables 1 and 2 are not clear with respect to if all compositions were cured under the same conditions, i.e. same belt speed.

The applicant apologizes for the unintelligibility of the term “cure rate” as used in the application. One skilled in the art would understand the screening test might be confusing to a person not used to this method.

“Cure rate” as used by the applicants is equal to the maximum belt speed that can be used to fully cure a sample of a defined formulation, containing a defined photoinitiator concentration, applied in a defined film thickness and cured under a defined irradiation source (lamp type, power).

“Fully cure” as used in the patent example means passing the “wiping test”, i.e. wiping of the coating surface to check if the surface is fully cured. This is a typical measurement for over print varnishes applied in thin layer thickness, where good surface cure is most critical. Thus a sample that passes the “wiping test” is considered to be fully cured.

In a typical example, the coating is passed under the lamp at a relatively low belt speed, and afterwards evaluated in the wiping test. The belt speed is then stepwise increased until at a certain belt speed, the cured sample does no longer passes the “wiping test”.

The highest belt speed at which the cured sample still passes the “wiping test” is taken as a measurement for the curing efficiency. This number (m/min) is given as “cure rate” in the examples of Tables 1 and 2. A higher “cure speed” thus means that a higher belt speed can be applied to achieve a fully cured sample. If all other parameters are being kept constant except the type of the photoinitiator, a higher “cure rate” is equal to a more efficient photoinitiator.

In regard to the “unexpected effect”:

The examiner deems that the results obtained with photoinitiators of formula II, III and IV are not unexpected when compared to results obtained with photoinitiators such as Darocur 1173 or Irgacure 184. The examiner’s argument is that compounds of formula II, III and IV are “bifunctional” photoinitiators that can be expected by one of ordinary skill in the art to produce more radicals than “monofunctional” photoinitiators such as Darocur 1173 or Irgacure 184.

The applicant respectfully disagrees with the examinator’s interpretation.

It is correct that compounds of formula II, III and IV are “bifunctional” photoinitiators that can principally produce four initiating radicals, while Darocur 1173 or Irgacure 184 are “monofunctional” photoinitiators that can produce at most two initiating radicals per molecule. It is also correct that when more radicals are formed, a faster cure speed can be expected.

However, it is obvious to the one skilled in the art that the two photoactive groups in photoinitiators of formula II, III and IV are *independent photoactive groups* linked by a spacer-O-, -CH_2CH_2-, --$CH(CH_3)$- or –$C(CH_3)_2$-. Thus, a photoreaction initiated by the absorption of a quantum of light by either of the two photoactive groups will initiate the cleavage of the corresponding photoactive group, while the other one remains unaffected. Therefore absorption of light quantum by a photoinitiator of formula II, III and IV will result in the formation of *two initiating radicals*, as it is the case for photoinitiators Darocur 1173 or Irgacure 184. Assuming that the quantum efficiency (i.e. the efficiency with which the absorbed light energy is transformed into the radical photoproducts) is approximately the same for all compounds considered, the *formation of a similar amount of radicals is expected for the absorption of the same amount of light energy (dose) by either of the photoinitiators of formula II, III, IV, Darocur 1193 or Irgacure 184* when used at the same concentration.

It is correct that the second photoreactive group in structures of formula II, III and IV can undergo a further, second photoreaction to produce two additional initiating radicals. This requires, however, the *absorption of a second quantum of light* per molecule, i.e. a higher light energy dose.

It is further obvious to the one skilled in the art that reducing the light dose applied on any of the photoinitiators of formula II, III, IV, Darocur 1193 or Irgacure 184 will result in a correspondingly lower amount of formed radicals.

Results of tables I and II were obtained at equal light intensities (lamp power), but at different exposure times (a higher “curing rate” (= belt speed) corresponds to a shorter exposure time to the lamp). Since the light dose is equal to the product of light intensity times exposure time, a higher “curing rate” is equal to a lower light dose. Thus the formulations containing photoinitiators of formula II, III and IV that are fully cured at a higher “curing rate” received less light energy (a lower light dose) than the formulations containing Darocur 1193 or Irgacure 184 cured at a lower “curing rate”.

Nevertheless, the instant photoinitiators provided cured samples of equal or even better (solvent resistance in Table 1) properties than those with the comparative photoinitiators.

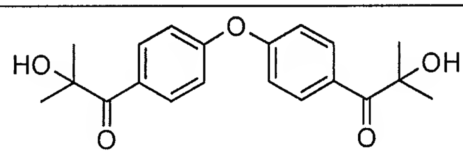
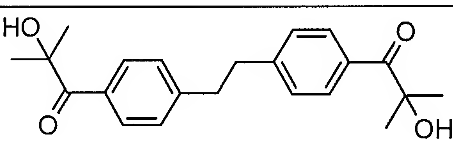
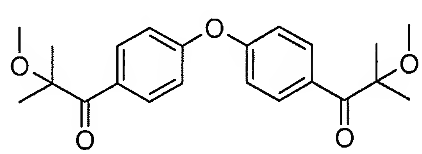
It could not be expected by the one skilled in the art that the same curing efficiency can be achieved with compounds of formula II, III and IV at a considerably lower energy dose than with Darocur 1173

or Irgacure 184. This is evidence for an unexpectedly higher curing efficiency of the photoinitiator structures of the instant patent application.

Table 1 shows the curing rate of overprint coating formulation including an aminoacrylate with the photoinitiators of claimed formulae (II), (III) and (V). These structures represent photoinitiators of example 1, 2 and 5 respectively.

The same formulations including aminoacrylate are also cured using standard photoinitiators, DAROCURE 1173 AND IRGACURE 184.

Table 2 shows the same overprint coating formulation without aminoacrylate using the photoinitiators of formula (II), (III) and (V) verses typical photoinitiators (DAROCURE 1173 and IRGACURE 184). The photoinitiators of formula (II), (III) and (V) show much improved curing rate over DAROCURE 1173 and IRGACURE 184.

Photoinitiator example	Structure of Photoinitiator	Cure Rate/with aminoacrylate	Cure Rate/without aminoacrylate
Example 1	 II	140	70
Example 2	 III	120	60
Example 5	 V	120	60

While it is true that Gaske teaches that the addition of aminoacrylates will improve curing rates, Gaske says nothing about improving curing rates to at least 100 meters/min. And as explained above it is quite surprising that the formulae (II), (III) and (V) are *unexpectedly higher curing efficiency*. Applicants point out that all three photoinitiators encompassed by claim 5, show cure speed rates that exceed 100 m/min when combined with aminoacrylates. This rate increase far exceeds that shown with the formulations absent the aminoacrylate. The cure rate is now incorporated as part of claims 5 and 15. And as explained above these results are truly surprising. To re-emphasize:

It could not be expected by the one skilled in the art that the same curing efficiency can be achieved with compounds of formula II, III and IV at a considerably lower energy dose than with Darocur 1173 or Irgacure 184. This is evidence for an unexpectedly higher curing efficiency of the photoinitiator structures of the instant patent application.

Applicants further point out that claim 15 now encompasses on structure (V), a structure not specifically disclosed in Felder.

Reconsideration and withdrawal of the rejection of claims 5, 9-11 and 15-21 is respectfully solicited in light of the remarks and amendments *supra*.

Since there are no other grounds of objection or rejection, passage of this application to issue with claims 5, 9-11 and 15-21 is earnestly solicited.

Applicants submit that the present application is in condition for allowance. In the event that minor amendments will further prosecution, Applicants request that the examiner contact the undersigned representative.

Respectfully submitted,

Shiela A. Loggins

Shiela A. Loggins
Agent for Applicants
Reg. No. 56,221

Ciba Specialty Chemicals Corporation
540 White Plains Road
Tarrytown, New York 10591
(914) 785-2768
SAL\22717R1.doc